a first means for coding said assigned symbols of the input object mask;

means for decomposing said input object mask into a plurality of object mask layers of different spatial resolution;

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a second means for coding a base object layer of said plurality of object mask layers; and

a third means for coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer.

REMARKS

Applicant's representative would like to thank Primary Examiner Y. Lee for kindly taking a substantial amount of time on October 19, 2001 to discuss the merits of the subject invention. Applicant's representative is aware of the time constraint that is placed on the Examiner and is appreciative of the Examiner's willingness to devote such large quantity of time to discuss the case on the merit.

In view of both the amendments presented above and the following discussion, the Applicant submits that none of the claims now pending in the application are anticipated under the provisions of 35 U.S.C. § 102. Thus, the Applicant believes that all of these claims are now in allowable form.

I. CLAIM 3 HAVING ALLOWABLE SUBJECT MATTER

Applicant acknowledges and expresses his appreciation for the indication in Paragraph 7 of the Office Action that claim 3 contains allowable subject matter, "if rewritten in independent form including all of the limitations of the base claim and any intervening claims".

Responsive to the Examiner, Applicant requests reconsideration of the Examiner's determination that claim 3

depends upon a rejected base claim for the reasons set forth below. It is respectfully submitted that Applicant's explanation below, place claim 3 in condition for allowance. Thus, the Applicant believes that claim 3 is now in allowable form.

II. REJECTION OF CLAIMS 1-2 AND 27-30 UNDER 35 U.S.C. § 102

The Examiner again rejected in Paragraphs 4-6 of the Final Office Action claims 1-2, and 27-30 under 35 U.S.C. §102(e) as being anticipated by Howard (US Patent 5,751,859, issued May 12, 1998). The rejection is respectfully traversed.

Specifically, the Examiner alleged that "Figure 5 of Howard Howard illustrates coding objects using a plurality of hierarchical layers, wherein decision for coding each layer is in accordance with information from any other layers". Applicant respectfully disagrees.

First, Howard teaches a hybrid arithmetic encoding method that includes pattern matching. Specifically, Howard states that "high compression of bilevel textual material is achieved through a soft pattern matching (SPM) method that combines the features of both the non-progressive JBIG encoder and the PM&S method". Howard then states that "pattern matching is used, not for directly substituting the matched character as in the PM&S methods, but to improve the context used by the coder in coding the pixels within the mark. High compression is achieved in a lossy mode whereby pixels are selectively reversed to their opposite value if and only if doing so reduces the code length without introducing any 'significant' changes to the image". (See Howard, Column 4, lines 12-33)

However, Howard fails to teach or suggest the novel concept of <u>decomposing an input object mask into a plurality of object mask layers and then coding a next higher layer of said plurality of object mask layers in accordance with information from a lower</u>

object mask layer. Specifically, Applicant's amended independent claims 1, 27 and 29 positively recite:

> 1. A method for coding an input object mask, where said input object mask has a plurality of regions, said method comprising the steps of:
>
> (a) assigning at least one symbol to each of the plurality of regions;
>
> (b) coding said assigned symbols of the input object mask;
>
> (c) decomposing said input object mask into a plurality of object mask layers of different spatial resolution;
>
> (d) coding a base object layer of said plurality of object mask layers; and
>
> (e) coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. (emphasis added)
>
> 27. A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to perform the steps of a method for coding an input object mask, where said input object mask has a plurality of regions, said method comprising the steps of:
>
> (a) assigning at least one symbol to each of the plurality of regions;
>
> (b) coding said assigned symbols of the input object mask;
>
> (c) decomposing said input object mask into a plurality of object mask layers of different spatial resolution;
>
> (d) coding a base object layer of said plurality of object mask layers; and
>
> (e) coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. (emphasis added)
>
> 29. An apparatus for coding an input object mask, where said input object mask has a plurality of regions, said apparatus comprising:
>
> means for assigning at least one symbol to each of the plurality of regions;
>
> a first means for coding said assigned symbols of the input object mask;
>
> means for decomposing said input object mask into a plurality of object mask layers of different spatial resolution;

a second means for coding a base object layer of said plurality of object mask layers; and

a third means for coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer. (emphasis added)

Applicant's invention teaches a method and apparatus for increasing the efficiency of scalable shape coding by correlating the coding of the mask of the object between different scales. Specifically, in the present invention, a new generic spatially-scalable shape coding method is disclosed that is independent of the mask decomposition scheme. More specifically, with reference to Applicant's Fig. 10, a full-resolution image frame having at least one object is initially segmented into a plurality of blocks or regions. For the purpose of mask generation, each block is assigned a mode or symbol to indicate whether it is "opaque", "transparent" or "border". The modes for the entire mask are then encoded into the bitstream.

Next, the method decomposes the "top level" or full-resolution mask into a plurality of layers or mask levels of different spatial resolution using any shape or mask decomposition methods, e.g., any of the decomposition methods as discussed in Applicant's FIGs. 2-6. The lowest mask layer, i.e., "base mask layer", is then encoded into the bitstream.

Next, the method hierarchically and contextually encodes mask layers that are above the base mask layer by using information from an immediate lower mask layer. Namely, each layer above the base mask layer (or "enhancement mask layer") is encoded using information that is derived from a mask layer that is immediately below the present mask layer of interest. In this manner, a generic spatially-scalable shape encoding method is provided that is capable of handling different shape or mask decomposition methods, while maximizing coding efficiency of the encoder.

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In contrast, as explained to the Examiner, Howard is completely devoid of any disclosure as to shape encoding. Howard is disclosing a new arithmetic encoding method that includes pattern matching and a pixel reverse scheme that selectively reverses a pixel to increase coding efficiency. Such arithmetic encoding method of the entire input image would not anticipate Applicant's shape encoding method that addresses shape encoding.

Second, the Howard reference is completely silent as to hierarchical decomposition. Applicant's invention addresses the criticality of scalability. As such, Applicant's invention specifically addresses and claims hierarchical decomposition of the "input object mask". Since Howard doesn't even address shape encoding, the Howard reference is completely devoid of any teaching as to the decomposition of such an "input object mask" into a plurality of layers.

Third, responsive to the Examiner, Applicant has further clarified the term "object mask layers" as "object mask layers of different spatial resolution" in all the independent claims. As explained to the Examiner during the interview, the term "object mask layers" inherently refers to "object mask layers of different spatial resolution" as defined in Applicant's specification. Nevertheless, Applicant has agreed to include the clarifying term. However, it should be noted that the clarifying term is **NOT** added to bypass the cited prior art. In other words, the added term would **not** narrow the claims because it is Applicant's position that the term "object mask layers" is inherently defined as "object mask layers of different spatial resolution" in view of Applicant's specification.

Finally, as explained to the Examiner, fig. 5 of Howard does not disclose "coding objects using a plurality of hierarchical layers, wherein decision for coding each layer is in accordance with information from any other layers". Specifically, Howard

states that "this extension involves repeatedly using the QM-Coder, narrowing the range of possible values at each step" and "in effect, integers are put at the leaves of a binary tree and the binary QM-Coder is used to code the sequence of branches needed to reach the desired integer". (Howard, Column 6, lines 61-65) "Part of this tree is shown in Fig.5". (Howard, Column 7, line 11) Thus, fig. 5 of Howard illustrates a "binary tree" to assist in statistical encoding, but it does not illustrate coding objects using a plurality of hierarchical layers.

Thus, the Applicant respectfully submits that Howard would not anticipate Applicant's invention. As such, Applicant respectfully submits that independent claims 1, 27 and 29 are not anticipated by Howard and, as such, fully satisfy the requirements of U.S.C. § 102 and are patentable thereunder.

Furthermore, dependent claims 2-3, 28, and 30 depend directly or indirectly from claims 1, 27 and 29 and recite additional features therefor. Since Howard fails to teach or suggest claims 1, 27 and 29 of Applicant's invention, Applicant respectfully submits that dependent claims 2-3, 28, and 30 are not anticipated by the teachings of Howard and, as such, fully satisfy the requirements of U.S.C. § 102 and are patentable thereunder.

Conclusion

Thus, the Applicant submits that all of these claims now fully satisfy the requirements of 35 U.S.C. §102. Consequently, the Applicant believes that all these claims are presently in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issue are earnestly solicited.

If, however, the Examiner believes that there are any unresolved issues requiring the maintenance of the present

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adverse final action in any of the claims now pending in the application, it is requested that the Examiner telephone Mr. Kin-Wah Tong, Esq. at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

10/19/01

Kin-Wah Tong, Attorney
Reg. No. 39,400
(732) 530-9404

Moser, Patterson & Sheridan, LLP
Attorneys at Law
595 Shrewsbury Ave.
1st Floor
Shrewsbury, New Jersey 07702

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Appendix

1. (Amended) A method for coding an input object mask, where said input object mask has a plurality of regions, said method comprising the steps of:

(a) assigning at least one symbol to each of the plurality of regions;

(b) coding said assigned symbols of the input object mask;

(c) decomposing said input object mask into a plurality of object mask layers <u>of different spatial resolution</u>;

(d) coding a base object layer of said plurality of object mask layers; and

(e) coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer.

27. (Twice amended) A computer-readable medium having stored thereon a plurality of instructions, the plurality of instructions including instructions which, when executed by a processor, cause the processor to perform the steps of a method for coding an input object mask, where said input object mask has a plurality of regions, said method comprising the steps of:

(a) assigning at least one symbol to each of the plurality of regions;

(b) coding said assigned symbols of the input object mask;

(c) decomposing said input object mask into a plurality of object mask layers <u>of different spatial resolution</u>;

(d) coding a base object layer of said plurality of object mask layers; and

(e) coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer.

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29. (Twice amended) An apparatus for coding an input object mask, where said input object mask has a plurality of regions, said apparatus comprising:

means for assigning at least one symbol to each of the plurality of regions;

a first means for coding said assigned symbols of the input object mask;

means for decomposing said input object mask into a plurality of object mask layers <u>of different spatial resolution</u>;

a second means for coding a base object layer of said plurality of object mask layers; and

a third means for coding a next higher layer of said plurality of object mask layers in accordance with information from a lower object mask layer.